

## COIN DROP MECHANISM

### Background of the Invention

#### Field of the Invention

**[0001]** The present invention relates to vending machines and, more particularly, to a coin mechanism used to actuate vending machines.

#### Description of the Related Art

**[0002]** Vending machines and coin mechanisms for operating such machines are well known in the art. Such vending machines are located in a variety of locations, often making the machines subject to weather extremes and abuse, such as fraudulent attempts to obtain product without inserting the required purchase price. Accordingly the coin mechanism for such machines must be of a non-complex design capable of withstanding such abuse.

**[0003]** Some conventional coin mechanisms are complex and utilize electronic parts to actuate the coin mechanism. Other conventional coin mechanism designs are mechanically operated but employ a complex arrangement. Although such mechanisms may be versatile and perform well under ideal conditions, they are inherently expensive and prone to requiring frequent maintenance due to the harsh conditions under which vending machines sometimes operate.

**[0004]** Conventional coin mechanism designs that are mechanically operated usually require a user to turn a knob or rotate a lever to actuate the mechanism. Such modes of actuation are difficult and sometimes painful for individuals with limited hand movement, such as individuals who suffer from arthritis or similar debilitating conditions.

### Summary of the Invention

**[0005]** In one embodiment of the present invention, a coin mechanism includes a coin slot formed via the interaction of two movably joined members, where at least one of the members has a contoured channel formed thereon. The contoured channel is configured to receive and guide at least one coin of a required denomination to a desired position aligned with an actuator opening on at least one of the members.

[0006] A user can actuate the coin mechanism to dispense a product by actuating an actuator. The actuator causes an actuation member to travel through the actuator opening in one member, engage a coin against the surface of the channel member, and displace the channel member relative to the support member. The channel member is connected to a product delivery system, which is configured to deliver a desired product upon displacement of the channel member.

[0007] The coin mechanism advantageously does not require complex electronic or mechanical parts. Additionally, the mechanism advantageously does not require the turning of a knob or rotation of a lever, minimizing the discomfort or pain suffered by individuals with limited hand movement during actuation of the mechanism.

[0008] Further, the contoured shape of the of the coin mechanism channel advantageously prevents fraudulent attempts to obtain a selected product by inserting, for example, an elongated flat object into the coin slot instead of the at least one coin.

[0009] Other embodiments, advantages, and features of the present invention will become readily apparent to those skilled in this art from the ensuing detailed description of preferred embodiments thereof.

#### Brief Description of the Drawings

[0010] Figure 1a is a frontal perspective view of one embodiment of a coin mechanism.

[0011] Figure 1b is a rear perspective view of the mechanism of Figure 1.

[0012] Figure 1c is an exploded perspective view of the coin drop mechanism of Figure 1.

[0013] Figure 1d is a perspective frontal view of a coin receiving channel member in accordance with one embodiment of a coin drop mechanism.

[0014] Figure 1e is perspective view of the coin receiving channel member in Figure 1d with a coin of a different denomination than required by the coin drop mechanism.

[0015] Figure 1f is a rear perspective view of a support member in accordance with one embodiment of a coin drop mechanism.

[0016] Figure 2a is a crossectional side view of a vending machine incorporating one embodiment of a coin drop mechanism in a non-actuated state.

[0017] Figure 2b is a crossectional side view of the vending machine of Figure 2a with the coin drop mechanism in an actuated state.

[0018] Figure 2c is a crossectional view of the vending machine of Figure 2a with the coin drop mechanism in an actuated state while dispensing the last product in the machine.

[0019] Figure 3a is a crossectional side view of another vending machine incorporating one embodiment of a coin drop mechanism in a non-actuated state.

[0020] Figure 3b is a crossectional side view of the vending machine of Figure 3a in an actuated state.

[0021] Figure 3c is a crossectional side view of the vending machine of Figure 3a in an actuated state while dispensing the last product in the machine.

Detailed Description of the Preferred Embodiment

[0022] Figures 1a-1f illustrate a coin mechanism 100 according to one embodiment of the present invention. The mechanism 100 preferably comprises a support member 10 and a channel member 20. The members 10, 20 are shown as plates 10, 20 in the illustrated embodiment. However, the members 10, 20 are not limited to any geometrical shape. The members 10, 20 comprise inner surfaces 12a, 22a and outer surfaces 12b, 22b, respectively.

[0023] The members 10, 20 are preferably made of metal, such as steel or aluminum. However, the members 10, 20 can be made of any material having structural characteristics suitable for use in a coin mechanism 100, such as a hard plastic. Additionally, the members 10, 20 are preferably connected together so as to allow movement of the members 10, 20 relative to each other about an axis "Z". For example, the support member 10 can have a female portion 30a, such as a hook, and the channel member 20 can have a male portion 30b configured to fit in the female portion 30a to form a hinge 30 that connects the members 10, 20. However, the members 10, 20 can be connected using any structure that allows them to pivot relative to each other.

[0024] At least one of the members 10, 20 preferably comprises a contoured channel 40 formed on a surface thereof extending from a proximal end 24 to a distal end 26. In the illustrated embodiment, the channel 40 is formed on the inner surface 22a of the

channel member 20. The channel 40 is configured to define a slot 40a between the members 10, 20 when the members 10, 20 are in contact with each other.

**[0025]** The channel 40 comprises a first and second contoured walls 42a, 42b. The walls 42a, 42b preferably extend from the proximal end 24 to the distal end 26 of the channel 40. Additionally, the walls 42a, 42b are preferably configured to allow coins of denominations other than that required for operation of the mechanism 100 to fall through the channel 40, as discussed further below.

**[0026]** The contoured channel 40 is preferably configured to receive and guide at least one coin of a specific denomination required by the mechanism 100 to a desired location on the channel 40. Accordingly, the channel member 20 functions as a coin receiving channel member. For example, the channel 40 can be configured to receive quarters. Additionally, the contoured walls 42a, 42b are preferably configured to allow the mechanism 100 to operate only with coins of the specific denomination, as discussed further below.

**[0027]** Two coins 44a, 44b are shown in the illustrated embodiment, but it is understood by one of ordinary skill in the art that the mechanism 100 can equally operate with any number of coins. In one embodiment, the contoured channel 40 guides X-1 of X-number of coins (not shown) inserted into the mechanism 100 to a desired location, such that the X-1 coins are disposed substantially adjacent to each other about a common axis. In this embodiment, the channel 40 is configured to guide the X coin to a location on top of the X-1 coins. As used herein, X represents a numerical quantity of coins.

**[0028]** As illustrated in Figures 1c-d, the channel 40 is further configured to align one of the coins 44b with actuator openings 46a, 46b formed on the members 10, 20 when the coin 44b is in the desired location. The contoured walls 42a, 42b of the channel 40 each preferably comprises at least one protrusion 48a, 48b configured to help guide the coins 44a, 44b to the desired location.

**[0029]** The mechanism 100 optionally comprises a coin return actuator 50 removably connected to the support member 10 with a fastener 52. The actuator 50 can optionally comprise a spring 53 and be configured to pivot about an axis "Y" defined by the fastener 52. The fastener 52 can be, for example, a bolt or a screw or multiple bolts or screws, or a snap-fit pivot. However, one of ordinary skill in the art will recognize that any

fastener 52 suitable for removably connecting the coin return actuator 50 to the support member 10 can be used.

**[0030]** The coin return actuator 50 preferably comprises a protrusion 54 configured to protrude through an opening 56a formed on the support member 10, through the channel 40, and into a recessed opening 56b formed on the channel 40. The protrusion 54 is further preferably configured to contact and hold one coin 44a against the contoured wall 42a when the coin return actuator 50 is not actuated. Similarly, when the coin return actuator 50 is actuated, the protrusion 54 is preferably configured to disengage the coin 44a, to travel out of the recessed opening 56b, and to travel into the opening 56a at least enough so the protrusion 54 does not protrude from the inner surface 12a of the support member 10.

**[0031]** In the illustrated embodiment, the coin mechanism 100 is configured to operate with two coins 44a, 44b, such as quarters. As noted above, the protrusion 54 is configured to engage one of the coins 44a against the contoured wall 42a when the coin return actuator 50 is not actuated. The protrusion 54 is preferably disposed in relation to the contoured walls 42a, 42b so as to contact and hold only coins inserted into the channel 40 that are of the specific denomination required for operation of the mechanism 100. That is, coins of a different denomination than that required for the actuation of the mechanism 100 would fall through the channel 40 into a coin return area 92, preferably formed on the support member 10 and aligned with the channel 40, via a coin return slot 92a. Additionally, the protrusion 54 is further preferably disposed in relation to the contoured walls 42a, 42b such that even if a user inserted a first coin 44a of the required denomination into the channel 40, said coin 44a held by the protrusion 54, coins of a different denomination 44c subsequently inserted into the channel 40 would fall through the channel 40 into the coin return area 92, as illustrated in Figure 1e.

**[0032]** In another embodiment, the coin mechanism 100 is configured to operate with just one coin 44b. In this embodiment, the protrusion 54 is preferably configured to extend through a second opening 57a formed on the support member 10, through the channel 40, and into a second recessed opening 57b formed on the channel 40. For example, the protrusion 54 can have a cylindrical shape (not shown) configured to contact and hold the coin 44b against the contoured wall 42a. As discussed above, the protrusion 54 is preferably

disposed in relation to the contoured walls 42a, 42b so as not to contact and hold coins inserted into the channel 40 that are not of the specific denomination required for operation of the coin mechanism 100. For example, if the coin mechanism 100 is configured to operate with one quarter, and a user instead inserts a nickel, the nickel would fall through the channel 40 and into a coin return area 92.

[0033] The mechanism 100 optionally comprises at least one coin guide 60 disposed, for example, on the inner surface 22a of the channel member 20. The at least one coin guide 60 preferably protrudes over the contoured channel 40 and is configured to contact the at least one coin 44a, 44b during actuation of the coin mechanism 100.

[0034] Figure 1c illustrates an exploded view of one embodiment of the coin drop mechanism 100. The coin drop mechanism 100 preferably comprises an actuator 70 disposed frontward of the outer surface 12b of the support member 10.

[0035] The actuator 70 preferably comprises a contact portion 70a and at least one support element slidably disposed through the members 10, 20. The actuator 70 comprises two support elements 72a, 72b in the illustrated embodiment. Each of the support elements 72a, 72b defines a front portion 74a, 74b disposed between the contact portion 70a and the support member 10. The support elements 72a, 72b preferably removably connect to a third member 76 disposed next to the channel member 20. The third member 76 preferably comprises a spring 76a configured to contact a flag member 77a movably connected to the support member 10. Each front portion 74a, 74b preferably comprises a spring element 78. The actuator 70 further comprises an actuation member 79 configured to travel through at least one of the actuator openings 46a, 46b of the members 10, 20. In one embodiment, the actuation member 79 preferably is a rectangular metal bar or plate formed, for example, via a stamping process. However, the actuation member 79 can have other shapes suitable for use in the coin mechanism 100, such as square, oval, and round. Additionally, the actuation member 79 can be made of other materials with structural characteristics suitable for use in the coin mechanism 100, such as a hard plastic.

[0036] Figure 2a illustrates a vending machine 200 incorporating one embodiment of the coin drop mechanism 100. The vending machine 200 preferably has a product receptacle 80 configured to hold at least one product 82 therein. In the illustrated

embodiment, the product receptacle 80 is configured to receive and hold a plurality of individual products 82. The channel member 20 preferably connects to a product support member 84 defining an opening 86 therethrough. For example, in one embodiment, the channel member 20 has a female portion 20a, such as a hook, that removably receives a male portion 20b of the product support member 84 therein. However, any structure suitable for connecting the channel member 20 to the product support member 84 can be used. In one embodiment, the channel member 20 and the product support member 84 are integrally formed. The opening 86 of the support member 84 defines an edge 88 configured to contact and support a selected product 82a in the product receptacle 80. Additionally, in one embodiment, the product support member 84 can be slidably connected to the product receptacle 80 via a rail system (not shown). Alternatively, the product support member 84 can be movably connected to the product receptacle 80 using other suitable structure(s).

**[0037]** During operation, a user inserts the at least one coin 44a, 44b into the slot 40a. The channel 40 guides the at least one coin 44a, 44b to a desired location, preferably via gravity, such that the at least one coin 44b is aligned with the actuator openings 46a, 46b. The user then preferably actuates the actuator 70 by pressing the contact portion 70a, thus generating an actuation force.

**[0038]** When a user actuates the actuator 70, the support elements 72a, 72b movably displace through the members 10, 20, which in turn displaces the third member 76 such that the spring 76a contacts the flag member 77', as shown in Figure 2b. The spring 76a preferably causes the flag member 77' to pivot so as to contact and hold in place at least one of the products 82 in the product receptacle 80 through an opening 80b. The products 82 are preferably disposed above the selected product 82a. At least one spring element 78 disposed on the front portions 74a, 74b of the support elements 72a, 72b generates a return force on the contact portion 70a of the actuator 70.

**[0039]** Additionally, actuation of the actuator 70 causes the actuation member 79 to travel through the actuator opening 46a in the support member 10, engage the at least one coin 44b with an edge thereof, and transmit the actuation force to the at least one coin 44b to displace the channel member 20 relative to the support member 10, as shown in Figure 2b. Displacement of the channel member 20 relative to the support member 10 causes at least

one of the coins 44a, 44b to fall into a coin bank 90. Also, displacement of the channel member 20 in turn displaces the product support member 84 such that the opening 86 is aligned with the selected product 82a, causing the selected product 82a to be dispensed from the receptacle 80, as shown in Figure 2c. In one embodiment, the actuation member 79 comprises a stepped portion 79a along its length. At some point during the actuation process, when the stepped portion 79a passes through the actuator opening 46a in the support member 10, the edge in contact with the at least one coin 44b shifts relative to the coin 44b, causing the edge to release the coin 44b, which falls into the coin bank 90. Release of the coin 44b preferably coincides with the dispensing of the selected product 82a from the receptacle 80.

[0040] Upon release of the actuator 70, the support elements 72a, 72b movably displace such that the spring 76a of the third member 76 disengages the flag member 77', which in turn disengages the product(s) 82 in the receptacle 80. Additionally, the actuation member 79 withdraws from the channel member 20 and into the actuator opening 46a. The return force caused by the at least one spring element 78 causes the third member 76 to displace the channel member 20 into contact with the support member 10. Displacement of the channel member 20 in turn displaces the product support member 84 such that the edge 88 of the opening 86 contacts and supports the products 82 in the product receptacle 80.

[0041] The coin mechanism 100 advantageously prevents dispensation of a product without having inserted the required number of coins into the mechanism 100. If a user attempts to obtain a product without any coins in the mechanism 100 by actuating the actuator 70, the actuation member 79 travels through the actuator openings 46a, 46b in both members 10, 20 without causing the channel member 20 to displace relative to the support member 10. Additionally, the contoured walls 42a, 42b of the channel 40 prevent a user from inserting, for example, an elongated flat element into the coin slot 40a in an attempt to actuate the coin mechanism 100 without inserting the at least one coin 44a, 44b. Further, as discussed above, the coin mechanism 100 advantageously prevents use of coins that are not of the specific denomination required by the mechanism 100, by allowing said different coins to fall through the channel 40 and into the coin return area 92 via the coin return slot 92a.

[0042] Additionally, the at least one coin guide 60 also advantageously prevents the at least one coin 44a, 44b from falling into the coin return area 92 when the mechanism

100 is actuated. The at least one coin guide 60 is configured to direct the at least one coin 44a, 44b away from a location above the coin return area 92 and toward a location above the coin bank 90 when the mechanism 100 is actuated to displace the channel member 20 relative to the support member 10.

**[0043]** In one embodiment, the flag member 77' advantageously prevents a user from inserting coins into the coin slot 40a when the vending machine 200 is out of product. As discussed above, during actuation of the coin mechanism 100, the flag member 77' contacts and holds at least one of the products 82 in the product receptacle 80 while the product support member 84 is displaced so as to dispense only the selected product 82a, as shown in Figures 2b-c. When there is only one selected product 82a in the receptacle 80, and there is not at least one product 82 disposed above the selected product 82a, actuation of the coin mechanism 100 causes the spring 76a of the third member 76 to pivot the flag member 77' into a locked position such that a blocking portion 77a' protrudes into the slot 40a. The blocking portion 77a' prevents a user from inserting coins into the coin slot 40a after the last selected product 82a has been dispensed. The flag member 77' can be reset to an unlocked position by an operator upon placement of at least one product 82, in addition to the selected product 82a, in the receptacle 80.

**[0044]** Figures 3a-c illustrate another vending machine 300 incorporating one embodiment of the coin drop mechanism 100. The vending machine 300 preferably comprises an alternate design for a product support member 84a used in conjunction with the coin mechanism 100. The product support member 84a preferably pivotally connects to the product receptacle 80a and a connector 84b. The connector 84b in turn connects to the channel member 20. In the illustrated embodiment, the product receptacle 80a is configured to preferably receive a plurality of products 82b having a circular crosssection. The product support member 84a preferably comprises a generally concave surface 84c configured to contact a selected product 82c, when the coin mechanism 100 is not actuated. The generally concave surface 84c preferably defines a lower edge 84d and an upper edge 84e.

**[0045]** As previously described, upon actuation of the coin mechanism 100, the channel member 20 is displaced relative to the support member 10. As shown in Figure 3b, the channel member 20 in turn displaces the connector 84b toward the receptacle 80a,

causing the product support member 84a to rotate such that the lower edge 84d does not support and is not disposed beneath the selected product 82c, and the upper edge 84e is above the selected product 82c and supports the at least one product 82b. Accordingly, the selected product 82d can be dispensed as discussed above.

**[0046]** Upon release of the actuator 70, the channel member 20 returns into contact with the support member 10, as previously described. In turn, the channel member 20 displaces the connector 84b away from the receptacle 80a, causing the product support member 84a to rotate such that the lower edge 84d supports and is disposed beneath one of the products 82b, which becomes the selected product 82c.

**[0047]** The flag member 77 is generally in an unlocked position when there is at least one product 82b in the product receptacle 80a above the selected product 82c. However, the flag member 77 is preferably biased to move into a locked position when there is not at least one product 82b in the product receptacle 80a disposed above the selected product 82c, as shown in Figure 3c. In the locked position, the blocking portion 77a protrudes into the slot 40a, preventing a user from inserting coins into the mechanism 100. Optionally, the spring 76a can move the flag member 77 into the locked position upon actuation of the mechanism 100 when there is not at least one product 82b in the product receptacle.

**[0048]** Although the inventions disclosed herein have been disclosed in the context of certain preferred embodiments and examples, it will be understood by those skilled in the art that the inventions disclosed herein extend beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the inventions and obvious modifications and equivalents thereof. Thus, it is intended that the scope of the inventions disclosed herein should not be limited by the particular disclosed embodiments described above, but should be determined only by a fair reading of the claims that follow.